

speaker, yet that physical E., according to its definition, is not capable of having such epithets applied to it, except in senses which are not intended by those doctors. Active E. would not be E. or "the power of performing work," it would be rather the *performing* of that work. "Active E." being thus incorrect, its above antithetics, or approximate antithetics, are incongruous expressions, or else have meanings different from what is intended. If "reposing," "dormant," "quiescent" E. have any meaning, it is that of "unavailable E." If "quiet" and "tranquil" E. have any meaning, it is that of E. spending itself slowly and equably. Poor P. thinks that the expression, "passive E.," would sound very like a bull, whether used in a tap-room or in a lecture theatre. He dares not entertain the suspicion that these expressions had their origin in a momentary, latent, unconscious confusion between kinetic E. and action in the minds of the writers; but he knows that they are eminently calculated to cause a chronic intentional muddling of them both together in his own brain-pan.

Dublin

(To be continued.)

X.

On the Supposed Action of Light on Combustion

THE results obtained in the experiments mentioned by M. C. Tomlinson are to be attributed to the elevation of temperature of the candles exposed to solar light and heat.

The influence of light on combustion has been mistaken for the action of heat, which, in this instance, seems to have accelerated combustion, and in other instances *retards* it by increasing the heat of the air and diminishing the draft. That is why the sun shining over chimney-pots is said to cause smoke; it diminishes the ascensional speed of the air through the pipe.

Jersey, September 2

G. SAVARY

[On referring to Mr. Tomlinson's paper we find that out of four trials, with a number of candles to each, there was a greater consumption of material in the first and fourth trials in the light than in the dark; and in the second and third trials the consumption was greater in the dark than in the light; but in any case the difference was so small, amounting only to from two to seven grains per hour, that it may fairly be referred to accidental circumstances, such as differences in temperature, in currents of air, and in the composition and matter of the candles. Some of the trials were made in the diffused light of day, and in all the trials the differences in temperature between the dark and the light spaces were but small.—Ed.]

OUR ASTRONOMICAL COLUMN

THE SATELLITES OF MARS.—The following ephemeris of the outer satellite is deduced from the elements given in this column last week, except that the daily motion is corrected to $285^{\circ} 5' 147''$ by observations to Sept. 16:—

	At 8h. om.		At 10h. om.		G.M.T.	
	Pos.	Dist.	Pos.	Dist.	Pos.	Dist.
Sept. 24	247	75	237	61		
" 25	280	49	276	68		
" 26	52	54	26	34		
" 27	83	70	75	77		
" 28	192	29	129	31		
" 29	252	76	243	68		
" 30	297	35	274	55		
Oct. 1	60	63	44	44		
" 2	90	59	80	71		
" 3	217	38	167	25		
" 4	257	72	249	70		
" 5	328	26	286	41		

For the inner satellite the following elements may be taken as representing closely the Washington measures, August 17–20:—

Passage of Ascending Node, August 17^h 89^m 88^s G.M.T.

Longitude of node	82° 48'
Inclination of orbit	25° 24'
Period of revolution	0.31841 days.
Log. radius of orbit at mean distance of	0.9286
Mars from the sun	

They show the following differences of the calculated angles from those observed:—

Aug. 17	...	0.1	Aug. 19	...	+ 0.9
" 18	...	0.7	" 20	...	+ 0.1

The outer satellite has been observed on several nights by A. A. Common, Esq., of Ealing, with an 18-inch silver-on-glass reflector. On the 15th and 16th inst. excellent measures were made with this instrument, by means of which the period of revolution was corrected before calculating the above ephemeris. Mr. Common has stated to the writer that the satellite is ruddy, even more deeply-coloured than the body of the planet. It has also been observed on several occasions by M. M. Henry at the Observatory of Paris.

Employing Kaiser's value of the mean diameter of Mars at distance unity ($9'' 472$) it results that the inner satellite is distant from the centre of the primary 2.730 and the outer one 6.846 semi-diameters. As seen from the inner satellite the globe of Mars will subtend an angle of 40° , and as seen from the outer satellite, one of about 16° . The orbital motions per minute are respectively seventy-nine miles and fifty miles. Our own moon has a mean orbital velocity of thirty-eight miles per minute.

THE SATELLITE OF NEPTUNE.—The subjoined ephemeris is derived from Prof. Newcomb's tables:—

At 13h. Greenwich M.T.

	Pos.	Dist.		Pos.	Dist.
Sept. 30	30	15.2	Oct. 9	25	13.6
Oct. 1	314	5.7	" 10	101	6.3
" 2	231	14.9	" 11	46	16.2
" 3	209	14.7	" 12	23	13.0
" 4	122	5.7	" 13	294	7.5
" 5	49	15.4	" 14	225	16.5
" 6	27	14.2	" 15	201	12.3
" 7	291	5.9	" 16	86	7.5
" 8	228	15.8	" 17	44	16.7

The motion of this satellite is *retrograde* both with reference to the equator and to the ecliptic, and thus it presents the most decided case of retrograde motion in the planetary system; the motion of the satellites of Uranus, though retrograde upon the ecliptic, is direct upon the equator. For 1877 we have for the satellite of Neptune, from Prof. Newcomb's investigation—

For Equator.

For Ecliptic.

Node	183° 3'	184° 33'
Inclination	121° 42'	145° 13'

Adopting the mean of Mr. Lassell's and Mr. Marth's measures of the diameter of Neptune, taken at Malta in 1864–65, as the most reliable value hitherto published, we find that Prof. Newcomb's mean angular distance of the satellite from Neptune corresponds to a true distance of 14.552 semi-diameters of the primary (or about $219,000$ miles), which will therefore present an angular diameter of rather less than 8° as viewed from the satellite. The period of revolution being 5.8769 days, the mean orbital velocity of the satellite is 162 miles per minute.

THE BINARY α CENTAURI.—Mr. Gill has found time to measure this fine star with Lord Lindsay's heliometer at his present station, Mars Bay, Ascension, on four nights between July 22 and August 5. The distance of the components was then little over two seconds, the bright star preceding. The measures are evidently difficult from the magnitude and closeness of the stars, the separate night's results differing by more than 10° ; but Mr. Gill will doubtless establish an important epoch, and we may hope at the end of the year to have something like reliable elements of this the most interesting of all the revolving double stars.

METEORIC ASTRONOMY.—The second part of the publications of the Royal Observatory at Münster has appeared, and is entitled, "Resultate der in den 43 Jahren 1833–1875 angestellten Sternschnuppen-Beobachtungen, von Dr. Eduard Heis." It was close upon completion at the time of Dr. Heis's decease on June 30, the revision of the final sheets having been undertaken by one of his pupils. The work contains the times of occurrence and

the points of first and last appearance of some 13,000 meteors observed by Heis and the various colleagues who assisted him from time to time, followed by partial discussion of the results and catalogues of radiant points. A fuller account of this valuable publication must be reserved for a future note. The first number of this series contains Heis's long-continued observations on the zodiacal light.

A NEW COMET.—M. Coggia, of the Observatory at Marseilles, discovered a faint comet on September 14. Its position at 14h. 38m. 8s. mean time at Marseilles, was in R.A. 8h. 32m. 3^{rs}.; N.P.D., 41° 45' 59". Daily motion in R.A. — 45 seconds, in N.P.D. + 18 minutes. The comet has a central condensation, with trace of a tail.

CHEMICAL NOTES

ACTION OF ORGANIC SUBSTANCES INCREASING THE SENSITIVENESS OF CERTAIN SILVER SALTS.—Mr. M. C. Lea, of Philadelphia, has criticised, in a short paper, the theory brought forward by Poitevin and Vogel, that increased sensitiveness was imparted to the halogen compounds of silver by certain organic substances in virtue of their affinity for hydrogen. From experiments he has made he is led to the conclusion that these organic substances do not form substitution products as might be expected if they possessed an affinity for hydrogen, but that they all act as reducing agents. The natural view, therefore, of their action which Lea deduces is that the affinity of the organic substance for oxygen assists that of halogen for hydrogen, and, under the influence of light, a molecule of water becomes decomposed. That, in the case of tannin and silver iodide for instance, the tannin is oxidised, the iodine converted into hydriodic acid, and the silver salt more or less reduced. According to this theory traces of free acid would be found instead of the iodine substitution product. His experiments have confirmed this supposition, and he concludes, therefore, that the increase of sensitiveness produced by organic substances takes place in virtue of their affinity for oxygen promoting the decomposition of water by the halogen employed.

HEAT OF COMBUSTION OF OXYGEN AND HYDROGEN IN CLOSED VESSELS.—In a recent number of the *Journal* of the German Chemical Society there are some experiments on the above subject communicated by Than. He has modified Bunsen's ice calorimeter, so as to make it available for heat determinations in chemical action, and by this means he has obtained accurate results of the heat of combustion of electrolytic gases in closed vessels. The terms "heat of combustion," or "total difference of energy," are used by Than to express the quantity of actual energy evolved when the combining gas, in the case of oxygen and hydrogen at 0° and 760 mm., is completely converted in a closed vessel into water. Taking the atom of hydrogen as unity he finds that a gramme of hydrogen uniting with the requisite quantity of oxygen in a closed vessel to form water, produces 33.982 units of heat, which number agrees closely with that found by Andrews, viz., 33.970.

ON VAPOUR VOLUMES IN RELATION TO AVOGADRO'S LAW.—In the same journal (*Ber. chem. Ges.*, x.) there is a paper by Troost, detailing experiments made to determine the accuracy of Avogadro's theory that "equal volumes of substances in the state of vapour contained the same number of molecules," i.e., that the volume of the molecule of hydrogen being called 2, the volume of all other molecules must also be 2; instead of as happens in certain cases, apparently 4, 6, or 8. The method of experiment adopted was to introduce into the vapour of chloral hydrate a salt containing water having a dissociation-tension nearly equal to that of chloral hydrate; if the chloral hydrate vapour undergoes dissociation, and consists of equal volumes of chloral and aqueous vapours, then the vapour volume will remain constant; but if chloral hydrate is volatile as such, its vapour will be free

from water, and on introducing the salt it will give up water, and the volume of vapour will increase till the dissociation-tension is reached. The salt used was potassium oxalate, containing one molecule of water. Troost has found that the volume increases on the addition of the oxalate, leading him therefore to the conclusion that chloral hydrate undergoes volatilisation without decomposition.

CHEMICAL CONSTITUTION OF THE MINERALS HATCHETOLITE AND SAMARSKITE, FROM NORTH CAROLINA.—Mr. O. D. Allen has lately had an opportunity of making some further experiments on the above minerals lately described by Mr. J. L. Smith, and of which a short note was given some time ago in *NATURE*. His analytical results confirm those of Mr. Smith, and from these he deduces a ratio among the elements closely

corresponding to that of $\overset{\text{II}}{\text{R}}_2\overset{\text{V}}{\text{R}}_3\text{H}_2\text{O}$, or
 $\overset{\text{II}}{\text{R}}_2\overset{\text{V}}{\text{R}}_3\text{O}_7 + 2\overset{\text{II}}{\text{R}}\overset{\text{V}}{\text{R}}_2\text{O}_6 + 4\text{H}_2\text{O}$,

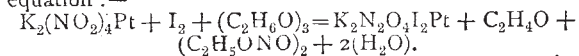
when $\overset{\text{II}}{\text{R}}$ represents one atom of a bivalent radical, or two

of sodium, and $\overset{\text{V}}{\text{R}}$, tantalum or columbium. The investigations of Rammelsberg point to the conclusion that three columbates (having columbium replaced by tantalum)

occur in minerals, viz., $\overset{\text{II}}{\text{R}}\overset{\text{V}}{\text{C}}\text{b}_2\text{O}_6$, $\overset{\text{II}}{\text{R}}_2\overset{\text{V}}{\text{C}}\text{b}_2\text{O}_7$, and $\overset{\text{II}}{\text{R}}_3\overset{\text{V}}{\text{C}}\text{b}_2\text{O}_9$, which, singly or combined with each other, constitute mineral species. Mr. Allen regards hatchetolite as composed of the first two, with a small quantity of normal titanate. He also thinks that it may have resulted from the alteration of a mineral possessing essentially the same composition as pyrochlore, by hydration, and removal of alkaline fluorides. From his analysis of samarskite a ratio is obtained closely approximating to that required

by the formula $\overset{\text{II}}{\text{R}}_2\overset{\text{V}}{\text{R}}_3\text{O}_7 + \overset{\text{II}}{\text{R}}_3\overset{\text{V}}{\text{R}}_2\text{O}_9$. From this it would appear that samarskite closely resembles fergusonite in chemical constitution, the formula of that latter body, deduced by Rammelsberg, being $\text{R}_3(\text{Cb}, \text{Ta})_2\text{O}_9$.

ON A NEW CLASS OF BODIES TERMED PLATOIOD-NITRITES.—Nilson has lately described in the *Ber. Berl. chem. Ges.* x., a series of bodies to which he has assigned the above name, and which he prepares by acting on potassium or barium platinonitrite with an alcoholic solution of iodine. Aldehyde is evolved on heating the mixture, which latter, originally brown, becomes of an amber colour. The platoiodnitrite is deposited in crystals. He has prepared the potassium salt in four-sided amber prisms, and assigns to it the formula $\text{K}_2\text{N}_2\text{O}_4\text{I}_2\text{Pt}(\text{H}_2\text{O})_2$. He represents the reaction by the following equation:—



He describes also a new acid obtained by decomposing barium platinonitrite with sulphuric acid and evaporating in vacuo. The first product consisted of an acid corresponding to the platotetranitrosylic acid of Lang, but on evaporating the solution to dryness, after removal of the first crystals, a permanent residue of a brownish-green colour remained, which, after drying over sulphuric acid, gave on analysis the following composition: $\text{H}_4(\text{NO}_2)_8\text{Pt}_3\text{O} \cdot 2(\text{H}_2\text{O})$. The author calls this triplato-octinitrosylic acid.

A NEW ACID.—At the last meeting of the *Nieder-rheinische Gesellschaft für Natur und Heilkunde* of Bonn Prof. Mohr announced the discovery of a new acid of phosphorus and oxygen, by Herr Th. Salzer, of Worms. The new acid stands between phosphorous acid and phosphoric acid, and consists, according to old notation, of one atom of phosphorus and four atoms of oxygen. It has been named hypophosphoric acid. It forms a rather insoluble soda salt. Herr Salzer found that the "acide phosphatique" described by Pelletier consists of a mixture of phosphorous and hypophosphoric acids.